

1                   Reclining Apparatus for Chair

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3                   **Field of Invention**

4       The present invention relates to a chair and, more particularly, to a  
5       reclining apparatus for use in a chair.

6

7                   **Background of Invention**

8       Referring to Figures 10 and 12, a chair is equipped with a conventional  
9       reclining apparatus 100 so that the chair can be reclined. The chair  
10      includes a base 122, a hydraulic cylinder 119 installed on the base 122, a  
11      seat 124 connected with the hydraulic cylinder 119 by means of the  
12      reclining apparatus 100 and a backrest 126 connected with the seat 124.

13

14      Referring to Figures 12 and 13, the reclining apparatus 100 includes a  
15      first joint 113 and a second joint 120 pivotally connected with the first  
16      joint 113. The joint 113 defines an aperture 118 for receiving the  
17      hydraulic cylinder 119. The second joint 120 is attached to the seat 124.  
18      The screw 114 includes a first end inserted through an aperture defined in  
19      the first joint 113 and a second end inserted through an aperture defined  
20      in the second joint 120. A nut 112 is screwed on the second end of the  
21      screw 114. A spring 117 is put around the screw 114. A nut/knob 115  
22      is screwed on the first end of the screw 114. As the seat 124 is reclined  
23      relative to the hydraulic cylinder 119, the spring 117 is compressed so as  
24      to "counter." The nut/knob 115 can be screwed or unscrewed on the  
25      screw 114 so as to adjust the range within which the seat 124 can be  
26      reclined relative to the hydraulic cylinder 119. However, the rotation of

1 the nut/knob 115 is exhausting and time-consuming. Hence, a tongue  
2 114 and a crankshaft 103 are used to adjust the range. The tongue 114 is  
3 movable into a space between the first joint 113 and the second joint 120  
4 through a window 110 defined in a front plate 128 formed on the second  
5 joint 120. The adjust block 114 includes a thick portion 106 and a thin  
6 portion 107 extending from the thick portion 106. When only the thin  
7 portion 107 is between the first joint 113 and the second joint 120, the  
8 range is large. When the thick portion 106 is between the first joint 113  
9 and the second joint 120, the range is small. The crankshaft 103 is  
10 rotationally mounted on two lugs 108 formed on the front plate 122.  
11 The crankshaft 103 includes a first crank 101 and a second crank 102.  
12 The first crank 101 is inserted in a lug 105 formed on the tongue 104.  
13 The second crank 102 is for abutment against the front plate 122. The  
14 rotation of the crankshaft 103 causes the movement of the tongue 104.  
15 It is however impossible to retain the seat in any reclined position relative  
16 to the hydraulic cylinder 119 with the conventional reclining apparatus  
17 100.

18

19 The present invention is therefore intended to obviate or at least alleviate  
20 the problem encountered in prior art.

21

22 **Summary of Invention**

23 It is the primary objective of the present invention to provide a chair with  
24 a reclining apparatus that can retain a seat in position relative to a  
25 hydraulic cylinder of the chair.

26

1 According to the present invention, a reclining apparatus is provided  
2 between a post and a seat of a chair. The reclining apparatus includes a  
3 first joint for attachment to the post, a second joint pivotally connected  
4 with the first joint for supporting the seat and a locking device for locking  
5 the second joint in one of several reclined positions relative to the casing.

6

7 Other objects, advantages and novel features of the invention will become  
8 more apparent from the following detailed description in conjunction  
9 with the attached drawings.

10

11 **Brief Description of Drawings**

12 The present invention will be described via detailed illustration of the  
13 preferred embodiment referring to the drawings.

14

15 Figure 1 is a perspective view of a reclining apparatus for use in a chair  
16 according to the preferred embodiment of the present invention.

17

18 Figure 2 is a cross-sectional view of the reclining apparatus of Figure 1,  
19 observed from the left.

20

21 Figure 3 is a cross-sectional view taken along a line 3-3 in Figure 2.

22

23 Figure 4 is similar to Figure 3 but shows the reclining apparatus in a  
24 different position.

25

26 Figure 5 is similar to Figure 4 but shows the reclining apparatus in a

1 different position.

2

3 Figure 6 is similar to Figure 2 but shows the reclining apparatus in a  
4 different position.

5

6 Figure 7 is similar to Figure 6 but shows the reclining apparatus in a  
7 different position.

8

9 Figure 8 is similar to Figure 7 but shows the reclining apparatus in a  
10 different position.

11

12 Figure 9 is similar to Figure 8 but shows the reclining apparatus in a  
13 different position.

14

15 Figure 10 is a right side view of a chair equipped with a conventional  
16 reclining apparatus.

17

18 Figure 11 is similar to Figure 10 but shows the chair equipped in a  
19 different position.

20

21 Figure 12 is a perspective view of the conventional reclining apparatus of  
22 Figure 10.

23

24 Figure 13 is an exploded view of the conventional reclining apparatus of  
25 Figure 12.

26

1    **Detailed Description of Preferred Embodiment**

2    Referring to Figures 1 and 2, a reclining apparatus 10 is used in a chair 72.  
3    The chair 72 includes a base 70 for installment on the ground, a hydraulic  
4    cylinder 71 installed on the base 70, a seat 90 connected with the  
5    hydraulic cylinder 71 via the reclining apparatus 10 and a backrest 80  
6    installed on the seat 90. The seat 90 can be reclined relative to the  
7    hydraulic cylinder 71 and kept in the reclined position by means of the  
8    reclining apparatus 10.

9

10   The reclining apparatus 10 includes a first joint 20 for attachment to the  
11   hydraulic cylinder 71, a second joint 30 pivotally connected with the first  
12   joint 20 for supporting the seat 90, a locking device 40 for locking the  
13   second joint 30 in one of several reclined positions relative to the first  
14   joint 20, a tuning device 50 for tuning the reclined positions of the second  
15   joint 30 relative to the first joint 20 and a lifting device 60 for controlling  
16   the hydraulic cylinder 71.

17

18   The first joint 20 is in the form of a casing. The casing 20 includes a  
19   bottom and two lateral walls. An aperture 21 is defined in the bottom of  
20   the casing 20. The hydraulic cylinder 71 is inserted into the casing 20  
21   through the aperture 21. An arched slot 22 and an aperture 24 are  
22   defined in each lateral wall of the casing 20.

23

24   The second joint 30 is in the form of a bracket. The bracket 30 includes  
25   a top member for supporting the seat 90 and two lateral members  
26   extending from the top member. Two apertures 33 and 34 are defined in

1 each lateral member of the bracket 30. A pin 31 is inserted in the  
2 apertures 33 of the bracket 30 and the apertures 24 of the casing 20.  
3 Another pin 32 is inserted in the apertures 34 of the bracket 30 and the  
4 arched slots 22 of the casing 20. Thus, the bracket 30 is pivotally  
5 connected with the casing 20.

6

7 Referring to Figure 3, the locking device 40 includes a mount 41 installed  
8 on the bottom of the casing 20. A rod 42 is movably installed on the  
9 mount 41. The rod 42 is connected with the pin 32 at an end and defines  
10 several dents 47 near an opposite end. A latch 43 is movably installed  
11 on the mount 41. The rod 42 and the latch 43 are movable in transverse  
12 directions so that the latch 43 can enter the dents 47. As the latch 43  
13 enters selective one the dents 47, the bracket 30 is locked in selective one  
14 of several reclined positions relative to the casing 20. A V-shaped lever  
15 46 is pivotally installed on the bottom of the casing 20. The V-shaped  
16 lever 46 includes a first end linked to the latch 43 and a second end  
17 connected with a link 45. The link 45 is further connected with a shaft  
18 44. The shaft 44 is rotationally installed on the lateral walls of the  
19 casing 20. A handle 48 extends transversely from the shaft 44.

20

21 Referring to Figures 3 and 4, pivotal of the handle 48 causes rotation of  
22 the shaft 44. The rotation of the shaft 44 causes movement of the link  
23 45. The movement of the link 45 causes pivotal of the V-shaped lever  
24 46. The pivotal of the V-shaped lever 46 causes the movement of the  
25 latch 43 into and from the dents 47.

26

1 Referring to Figure 2, the tuning device 50 includes two springs 54  
2 connected with the pin 32. The springs 54 are further connected with a  
3 bar 55. The bar 55 is further connected with a screw 53. The screw 53  
4 is further engaged with a nut/gear 52. The nut/gear 52 is further  
5 engaged with a worm 51. The worm 51 is rotationally installed on the  
6 lateral walls of the casing 20. A crank 56 extends from the worm 51.

7

8 Referring to Figures 5-7, rocking of the crank 56 causes rotation of the  
9 worm 51. The rotation of the worm 51 causes rotation of the nut/gear  
10 52. The rotation of the nut/gear 52 causes movement of the screw 53.  
11 The movement of the screw 53 causes movement of the bar 55. The  
12 movement of the bar 55 causes movement of the springs 54. Through  
13 the pin 32, the movement of the springs 54 causes pivotal of the rod 42  
14 about the latch 43 and therefore the reclining of the seat 90 relative to the  
15 hydraulic cylinder 71.

16

17 Referring to Figure 3, the lifting device 60 includes an L-shaped lever 62  
18 with a first section and a second section extending transversely from the  
19 first section. The first section of the L-shaped lever 62 is for contact  
20 with the hydraulic cylinder 71. The second section of the lever 62 is  
21 pivotally installed on one of the lateral walls of the casing 20. The  
22 second section of the L-shaped lever 62 is further in contact with a tab 63  
23 extending transversely from a shaft 61. The shaft 61 is rotationally  
24 installed on the lateral walls of the casing 20. A handle 64 extends  
25 transversely from the shaft 61.

26

1 Referring to Figures 8 and 9, pivotal of the handle 64 causes rotation of  
2 the shaft 61. The rotation of the shaft 61 causes pivotal of the tab 63.  
3 The pivotal of the tab 63 causes pivotal of the second section of the  
4 L-shaped lever 62. The pivotal of the second section of the L-shaped  
5 lever 62 causes movement of the first section of the L-shaped lever 62.  
6 The movement of the first section of the L-shaped lever 62 results in  
7 operation of the hydraulic cylinder 71.

8

9 The present invention has been described via detailed illustration of the  
10 preferred embodiment. Those skilled in the art can derive variations  
11 from the preferred embodiment without departing from the scope of the  
12 present invention. Therefore, the preferred embodiment shall not limit  
13 the scope of the present invention defined in the claims.

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